ONTARIO FOOD PROCESSING

RESEARCH & SERVICES COMMITTEE

2000 ANNUAL REPORT

TO

ONTARIO AGRICULTURAL SERVICES COORDINATING COMMITTEE

January 2001

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I. EXECUTIVE SUMMARY

The Ontario Food Processing Research and Services Committee (OFPRSC) has a mandate to identify and prioritize food research and non-research needs to facilitate the effective conduct of publicly funded food R& D and services.

In 1999, the OFPRSC issued a strategic report outlining priority research needs for the years 2000-20004. The report identified two broad priority areas of research: food safety and quality; and value-added products and innovative technologies. Within these two broad categories, specific recommendations from sub-committees reporting to the OFPRSC were identified. This report was targeted at federal and provincial funders of research in Ontario, including the University of Guelph as it prepared a new four year plan for the Food Research Program funded by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA).

In 2000, the focus of the OFPRSC annual meeting was to review initiatives undertaken since the *OFPRSC 1999 Strategic Report for 2000-2004* and determine how the priorities and recommendations were being addressed. The committee also reviewed and updated the priorities and recommendations listed in the *OFPRSC 1999 Strategic Report for 2000-2004*. The Expert Sub-Committees did not identify a need to meet during 2000. They will resume meetings in 2001. The purpose of this annual report is to provide an update to the *OFPRSC 1999 Strategic Report for 2000-2004*.

Ontario's food processing and agricultural sector continues to be one of the largest and most diversified in North America. There are over 3500 food processing firms in Ontario, employing over 85,000 people. The food and beverage sector is second only to transportation in terms of its contribution to the Ontario economy.

In 2000, a new Food Research Program was put in place at the University of Guelph, funded through the OMAFRA/University of Guelph Enhanced Partnership Agreement. The focus of the research is food safety and quality; value-added components in Ontario-grown foods; and innovative technologies to manufacture new food products. The program addresses several OFPRSC priorities, as well as those from the Ontario Food Engineering Research and Services Committee.

OFPRSC priorities and recommendations will be addressed though OMAFRA's Special Research Program (nutraceuticals and functional foods; risk assessment and risk control); and a new four year Food Safety Research Program. The Ontario Wheat Producers' Marketing Board is leading an initiative to fund a NSERC junior chair position at the University of Guelph in

cereal technology. This initiative, if successful, could help address significant gaps in the existing food processing research and education infrastructure in Ontario.

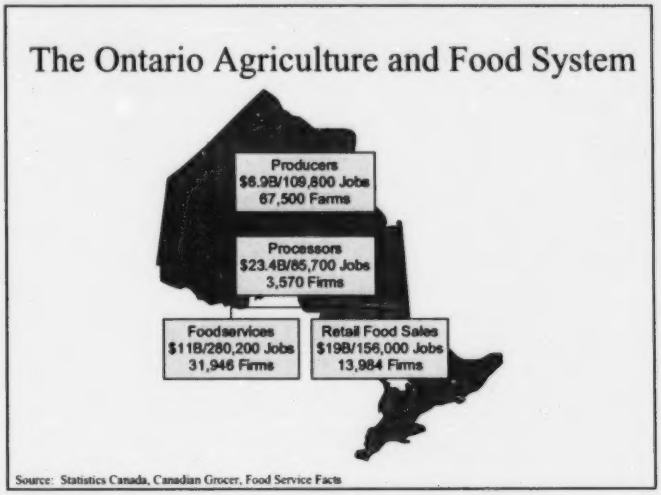
As Agriculture and Agri-food Canada plans for the future, an important focus will be the life sciences economy. This will involve a focus on higher value-added through the development of food and non-food products from raw agricultural commodities. The life sciences revolution is reflected in the recommendations made by OFPRSC sub-committees regarding value-added food products.

The OFPRSC reviewed the research priorities and recommendations included in the *OFPRSC 1999 Strategic Report for 2000-2004* and determined that they are still appropriate and relevant. Some minor changes were made to the recommendations to address the wide range of technologies needed in the food processing sector.

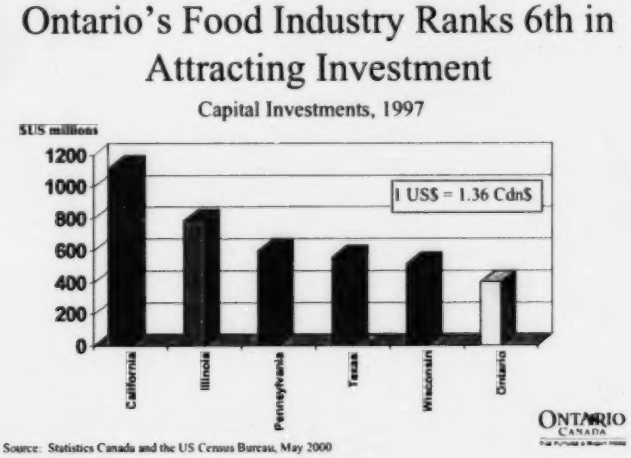
II. FOOD INDUSTRY SECTOR SCAN

The Ontario food processing industry is a vital part of Ontario and Canada's economy:

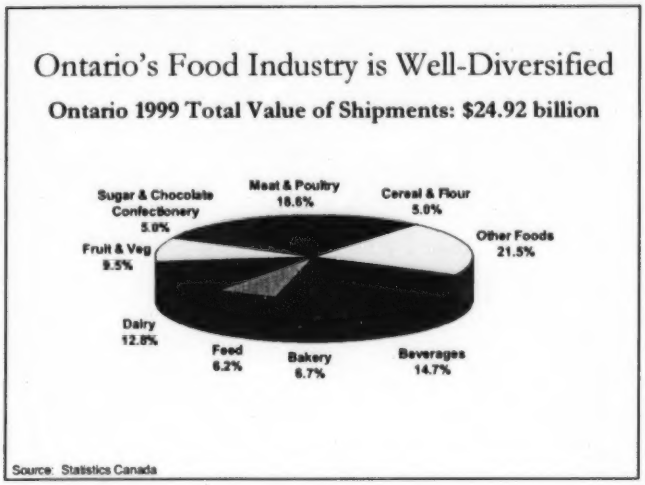
- Ontario processors provide 85,700 jobs while the food service and retail food sale sectors combined for over 436,200 jobs.



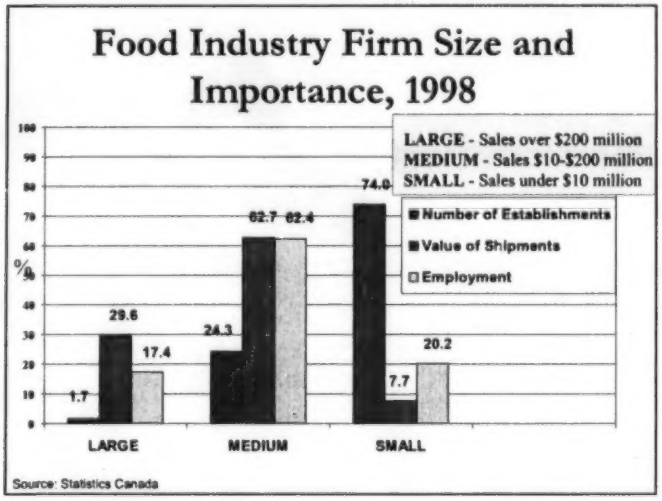
- The Ontario food and beverage sector is second only to transportation in terms of its contribution to the Ontario economy.
  - GDP from food and beverage industries is 13% of that from all manufacturing industries in Ontario.
  - Ontario generates 48.1% of the GDP of the total food and beverage industry in Canada.
  - In 1997, Ontario's food industry ranked 6th in North America for capital investment and 8th for value of shipments.



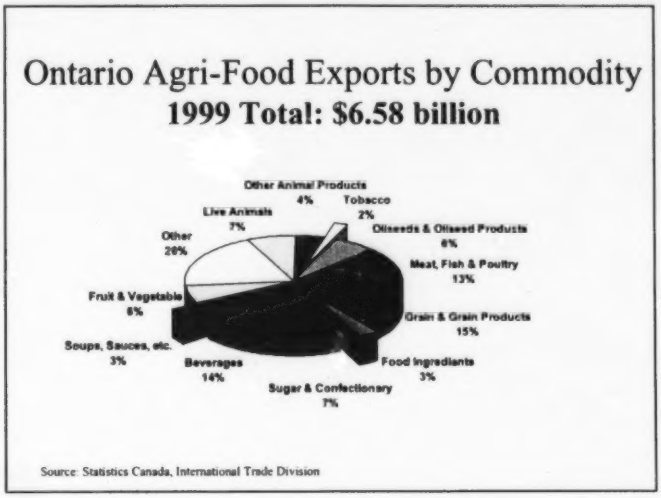
- The total value of shipments from the Ontario food industry in 1999 was 24.9 billion dollars. Meat and meat products accounts for the largest value of shipments (18.6%), followed by beverages (14.7%), dairy (12.8%), fruit and vegetables (9.5%), sugar and chocolate confectionery (5.0%), bakery (6.7%) and cereal and flour (5.0%).



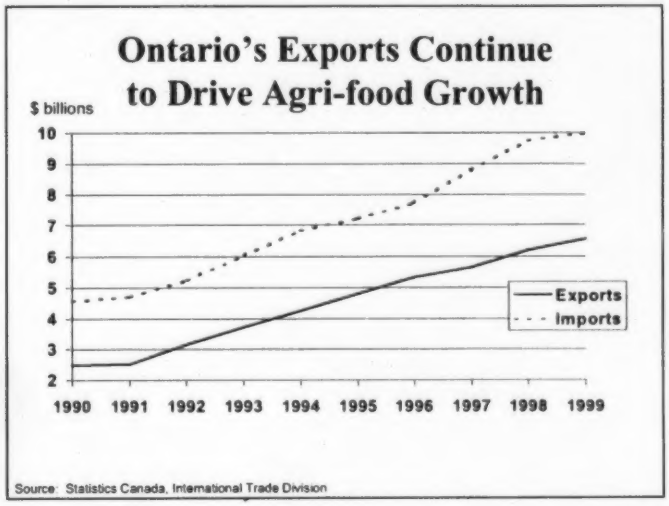
- In 1997, approximately 62% of the value of shipments in Ontario was done by medium sized industry firms (firms with annual sales between $10-200 million), as compared to large sized firms with approximately 30% of the value of shipments and small firms with less than 10%.



- 1999 Ontario agri-food exports totaled $6.58 billion. Eighty percent of all exports are now value-added, a figure which has increased substantially over the last few years.



- The dollar value of Ontario exports has shown steady growth over the past 10 years but at the same time the value of imports has also increased at a similar rate.



Trends in the Food Industry in 2000

- Biotechnology and genetically modified foods/organisms (GMO's) continue as key issues for the agri-food sector. While these topics received limited media attention in 2000, public policy forums remained active in examining labelling issues (Canadian General Standards Board is facilitating a process to develop protocols for voluntary labelling) and governments' regulatory role (Royal Society on Biotechnology).

- Heightened interest in opportunities to add value to commodities. These opportunities include innovative processing technologies that isolate components for specific functionality traits related to potential use in nutraceuticals, food ingredients, health products and non-food industrial uses. These products are part of the life science economy that is emerging globally.

- Continuing awareness of food safety issues by consumers and industry. Continuing implementation of HACCP as firms recognize the system can dramatically reduce the potential of contamination and improve product quality and consistency. A growing awareness that HACCP will be a requirement of firms that want to take part in the global market. An increase in concern about foodborne illness originating in fruits and vegetables, both fresh and minimally processed, makes food safety an issue that is capturing industry attention beyond the usual meat and meat products sector.

- Continued occurrence of mergers and consolidation in the food industry on a global basis. The largest of these mergers in 2000 was Unilever and Best Foods.

- Continuing movement within Canada to harmonize regulations governing nutritional labeling, health claims and nutrient enrichment with the U.S. to foster improved access to larger markets.

- In 2000, the dairy industry developed a new system for export of dairy products and pricing of exports.

- Decreasing costs, increasing market share and access to export markets remain key objectives for industry.

- The US economy was showing signs of a slow down in the 4th quarter of 2000 and economic growth projections for Ontario are being revised downward to an annual growth rate of just over 3% for early 2001.

III. ACTION TAKEN SINCE 1999 STRATEGIC REPORT

The OFPRSC held its annual meeting in December, 2000. The purpose of the meeting was to review new food research initiatives and determine how the priorities set by the OFPRSC in 1999 are being addressed. The priorities were also reviewed to determine if there were emerging issues which need to be addressed.

As a result of having done strategic planning in 1999, the Expert Sub-Committees that report to the OFPRSC did not meet in 2000. They will resume meetings in 2001. The Expert Sub-Committee chairs attended the OFPRSC annual meeting.

The following food research initiatives were discussed by the OFPRSC.

University of Guelph – Food Research Program

A new four year (2000-2004) Food Research Program was approved for funding at the University of Guelph by OMAFRA. The mission statement of the Food Research Program is: *to undertake research and information transfer to support Ontario food processors in the manufacturing of high quality products that are acceptable to Canadian consumers and competitive in world markets.*

Reports from the Ontario Agricultural Research and Services Committees were important reference documents for the development of the new program. The recommendations pertaining to food quality and safety and value-added products and innovative technologies from the *OFPRSC 1999 Strategic Report for 2000-2004* were incorporated into the program. The following recommendations from the Ontario Agriculture and Food Engineering Research and Services Committee were also considered:

- Improved technologies for preservation and cooking;
- On-line vision methods to detect defects; and
- Technologies to extract and stabilize nutraceuticals.

The new Food Research Program has three main objectives.

Objective 1: Ensure safety and improve quality of Ontario food products (To ensure that Ontario food products maintain their high quality standards in terms of microbial safety as well as sensory and nutritional factors while addressing the needs of producers, processors and consumers, research efforts are directed at four goals).

Objective 2: Develop value-added components in Ontario-grown foods. Functional foods are foods in traditional forms that provide specific health

benefits. Nutraceuticals have a non-traditional food form (pills, potions, elixirs).

Objective 3: Design innovative technologies to manufacture traditional and new food products. This includes the development of food manufacturing technologies that are acceptable in terms of sustainability, competitiveness and consumer values.

The objectives, goals and examples of research taking place to address each objective/goal are listed in APPENDIX C.

The Food Research Program will collaborate with other research programs at the University of Guelph, including the Centre for Food and Soft Materials Science, the Canadian Research Institute for Food Safety and the Human Nutraceuticals Research Unit. Collaborations will also take place with the Guelph Food Technology Centre and Agriculture and Agri-food Canada.

The funding for the Food Research Program is $1.7 million/year for four years. Further details on the research projects being funded through this program are available at www.uoguelph.ca/research.

OMAFRA Special Research Program

This program is in its third year of funding from the Innovation and Risk Management Branch of OMAFRA. It is an ongoing, matching fund designed to increase the competitiveness and sustainability of Ontario's agri-food sectors.

OASCC priorities are used to help develop priorities for the fund on an annual basis. The program in 2001 will focus on six priority areas:

1.New value-added food (nutraceuticals and functional food) and non-food products from Ontario agricultural raw materials;
2.Alternative livestock speci es in Ontario;
3.Antimicrobial resistance;
4.F ood safety risk assessment and risk control;
5.A hea lthy environment; and
6.Pest icide reduction and safe usage.

Information about this program and details of projects which have been funded can be found at: www.gov.on.ca/omafra/research.

Ontario's Food Safety System Review and Research Program

Over the past two years OMAFRA has gone through a review process of the food safety system in Ontario. Food safety hazards and risks are increasing as changes occur in food consumption patterns (e.g. ready-to-eat salads, meats;

eating out) and there are larger at-risk populations (young, old, immunocompromised). Some pathogens are virulent and resistant to drugs (e.g. E. coli 0157:H7). Ontario is challenged by new food safety hazards and more frequent food-borne illnesses and needs to keep up with modern national and international standards.

In Ontario, there is a need for better surveillance, diagnostic tools and industry advice. Legislation needs to be modernized and programs and standards need to be based on recent scientific findings and methods. OMAFRA, in cooperation with other provincial ministries, will implement several new initiatives, including new legislation over the next four years to address these issues.

One of the initiatives that will receive funding is the Food Safety Research Program. This program is currently under development. Starting in 2001, it will be a four year, four million dollar competitive program. Its purpose is to fund research to address the need to analyze emerging hazards and contaminants and improve efficiencies by developing more effective and faster tests, including quick field tests.

This program addresses several recommendations made by the OFPRSC including:

- Early detection and reduction/elimination methods
- Farm to fork processes for ensuring food safety
- Methods to improve quality/consumer acceptance
- On-line methods for monitoring/predicting quality.

Ontario Wheat Industry Opportunities Update

The Ontario Wheat Producers' Marketing Board (OWPMB) is developing opportunities to increase the utilization of Ontario wheat among value-added users. One of their initiatives is to support the creation of a cereal technology chair within the food science faculty at the University of Guelph. The cereal chair would be a junior NSERC chair and would work closely with researchers and staff at the Guelph Food Technology Centre and the AAFC's Food Research Program. The OWPMB is also interested in doing further research to address the fusarium issue and will be working with the University of Guelph to form a fusarium research team.

The OWPMB is currently working with the University to reach an agreement on the chair position and the wheat board's funding from CARD I allocation. An industry advisory committee to oversee the development of the position will be established and a fund-raising campaign to raise matching industry money as the basis for making application to NSERC will be undertaken in the upcoming months.

The OFPRSC is supportive of this initiative. The vacancy created by the retirement of Dr. Raspers has meant that there has been a gap in both teaching and research in the area of cereal technology. Recommendations made by the OFPRSC relating to cereals and oilseeds in the past have not been fully addressed because of lack of expertise at the University of Guelph and elsewhere in Ontario.

The OWPMB will be sponsoring a seminar in winter 2001 looking at opportunities for Ontario wheat.

Agriculture and Agri-food Canada's Life Sciences Initiative

Agriculture and Agri-food Canada (AAFC), in planning for the future, predicts that the life science revolution will reshape the agriculture and agri-food sector in the years to come. The life science revolution will apply our growing knowledge about biological systems to benefit all Canadians. The building blocks of the life sciences economy will include integrated horizontal approaches that will lead to increased knowledge in the life science and information technology economies. These technologies will be used to add value to raw agricultural commodities by converting them to products used in the biomedical, food, bioenergy and biomaterials.

The United States, Europe and Japan have recognized the opportunities in the life science economy and have set aggressive goals to achieve by 2010. AAFC has set a goal to be a world leader in the life sciences economy by 2010. The highly educated work force in Canada, soil and water resources, quality of public research and world reputation for safe, high-quality products are all attributes considered to give Canada an advantage in this area.

There is a role for provinces in terms of strategic investment, creation of favourable business climates, and harmonization of regulatory and legislative frameworks.

IV. RESEARCH AND DEVELOPMENT PRIORITIES FOR 2000

In the 1999 Strategic Report for 2000-2004, the OFPRSC grouped priorities into two broad priority areas of :

1. Food Safety and Quality
2. Value Added Products and Innovative Technologies.

At the OFPRSC 2000 Annual Meeting, the members reviewed the priority areas of research and determined them to still be appropriate and relevant. As in 1999, the OFPRSC did not rank these priority areas during their annual meeting, but retained the listing in an order that reflects the rankings of the subcommittees. The complete lists of priorities for the subcommittees can be found in the subcommittee reports of the 1999 Strategic Report for 2000-2004.

The OFPRSC did develop one additional recommendation for inclusion in the Value-Added Products and Innovative Technologies section. This recommendation is highlighted in this section in italics in this year's report.

1. Food Quality & Safety

Methods for early detection, and reduction/elimination of food safety hazards/contaminants:

- Improvement of quality and safety of minimally processed fruits and vegetables and development of protocols for early detection of pathogens and spoilage (Fruit and Vegetable Products and Processing #1a)
- Investigation of process techniques for reduction or elimination of deoxynivalenol (DON, vomitoxin), zearalenone, fumonisins and other mycotoxin components in cereal grains grown in Ontario. (Cereal Grain and Oilseed Products and Processing #2)
- Development of rapid, reproducible methods for detection and quantification of pathogenic *Campylobacter* in meat and poultry. (Meat Products and Processing #2)
- Development of efficient protocols for destruction of pathogens in fruits and vegetables (Fruit and Vegetable Products and Processing #2a)
- Identification and evaluation of intervention strategies for the destruction of pathogenic organisms in meat and meat products. (Meat Products and Processing #3)
- Development of procedure for *E.coli 0157:H7* reduction in uncooked fermented sausages and other ready-to-eat meat products (Meat Products and Processing #4)

"Farm to Fork" processes for ensuring food safety:

- Development of a risk assessment unit and tools to measure microbial risk assessment. (Meat Products and Processing #1)

- Development of methods to evaluate the effectiveness of HACCP programs at all levels (producer, processor, distributor and retailer) (Meat Products and Processing #5)

Methods to improve the quality and consumer acceptance of Ontario products:

- Improvement of the storage, processing and nutritional qualities of fruits and vegetables. (Fruit and Vegetable Products and Processing #1a)
- Investigation of alternatives to the use of chemical improvers in milling and bakery products (Cereal Grains and Oilseed Products and Processing #3)

On-line methods for monitoring and predicting quality during processing:

- Development of efficient on-line monitoring procedures for the safety and quality of raw produce and processed products (Fruit and Vegetable Products and Processing #2a)
- Development of on-line methods and technologies for monitoring product quality throughout milling and baking process (Cereal Grain and Oilseed Products and Processing #4)
- Development of rapid, on-line methodology for prediction of carcass end quality (Meat Products and Processing #7)

2. Value-added Products and Innovative Technologies

Methods to enhance the value of Ontario products:

- Isolation of value-added natural constituents from Ontario grown oilseeds and cereals and to improve the value of the products produced (Cereal Grain and Oilseed Products and Processing #1)
- Increase the levels of functional food ingredients/nutraceuticals in fruits and vegetables and to achieve increased understanding of their role in human health. (Fruit and Vegetable Products and Processing #1b)
    - Exploration of the potential for the development of novel health food products and cosmoceutical products from fruits, vegetables and the waste water generated during processing. (Fruit and Vegetable Products and Processing #1b)
    - Exploration of the application of biotechnology in improving fruit and vegetable production (Fruit and Vegetable Products and Processing #2b)

Development of innovative technologies to improve the manufacturing effectiveness of existing food products or to facilitate the production of new food products.

- Development of technologies to increase the efficiency of processing and automation of the fruit and vegetable processing industry. (Fruit and Vegetable Products and Processing #2a)

Development and evaluation of processing technologies that will limit the impact of the processing industry on the environment without unduly

affecting cost and competitiveness. (Cereal Grain and Oilseed Products and Processing #6)

Investigation of dry milling and heat processing techniques for pulses and legumes to develop flours and meals for products currently imported into Ontario. (Cereal Grains and Oilseeds Products and Processing #6)

V. NON - RESEARCH AND DEVELOPMENT PRIORITIES - 2000

OFPRSC supports the production of safe, quality food from a sustained environment irrespective of the technologies used. The Committee also supports consumer choice and the availability of comprehensive, unbiased information to encourage informed food purchasing decisions. The Committee recognizes the benefits of biotechnology, including safe quality food, improved nutrition, increased agri-food industry productivity, and improved environmental stewardship and advances in the production of pharmaceuticals. OFPRSC supports the use of science to minimize any possible risks associated with new technology. To this end, the Committee supports a strong food regulatory system and encourages the continued rigorous efforts of federal agencies to ensure food safety.

Consumer Education

Increased effort toward a consumer education strategy (including high school level) around safety and quality of Ontario grown and processed foods.

- Development of a consumer education strategy regarding food safety issues as a food safety intervention. (Meat Products and Processing)
- Greater effort is put into consumer education regarding the quality and safety of processed cereal grain and oilseed products. (Cereal Grain and Oilseed Products and Processing)

APPENDIX A: Ontario Food Processing Research And Services Committee Membership 2000

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APPENDIX B: OFPRSC Expert Sub-Committee Chairs - 2000

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Ontario Expert Sub-Committee on Fruits and Vegetables, Products and Processing Gopi Paliyath (Chair) Department of Food Science University of Guelph Guelph, ON N1G 2W1	Phone: (519) 824-4120 x4856 Fax: (519) 824-6631 gpaliyat@evbhort.uoguelph.ca
Ontario Expert Sub-Committee on Dairy Products and Processing (vacant)	

APPENDIX C: Objectives, Goals and Examples of Research Projects – University of Guelph Food Program

Objective	Goal	Examples of Research
1. Ensure safety and improve quality of Ontario food products.	1.1 Develop analytical methods to assess quality (sensory, microbial safety and nutritional) parameters in foods.	• Develop impedence methods for rapid detection of Salmonella spp. • Detection methods for spoilage organisms in minimally processed, ready-to-use vegetables. • Develop respiration method to predict low-temperature sweetening in potatoes during commercial storage and subsequent changes in chip colour during processing.
	1.2 Improve risk analysis in food systems that are relevant to Ontario processors	• Develop quantitative models for farm-to-fork microbial risk assessment with specific applications to the Ontario meat industry. • Characterization of foodborne pathogens using the Riboprinter.
	1.3 Improve understanding of relationships between molecular structures and functions of food components related to quality (sensory, microbial safety and nutritional).	• Use knowledge of molecular basis of chill injury to create novel, chill resistant varieties of tomatoes. • Relate crystal structure and therefore texture to composition of milkfat fractions. • Assess the functional properties of anti-freeze proteins isolated from Ontario winter wheat.
	1.4 Identify intervention strategies to improve food quality (sensory, microbial safety and nutritional).	• Improve cleaning and sanitizing procedures to effectively eliminate biofilms. • Improve design of processing equipment to minimize biofilm formation. • Develop stabilizer systems to effectively control ice recrystallization resulting from temperature fluctuations during storage.

Objective	Goal	Examples of Research
2. Develop value-added components in Ontario-grown foods.	2.1 Identify and develop "health-protectant" components in Ontario-grown foods	• Develop nutraceuticals from Ontario-grown blueberries. • Characterize the composition and physical properties of DHA –enriched milk and investigate potential to modify butter texture.
	2.2 Characterize functionality and clinical efficacy of functional foods and nutraceuticals by human and animal studies	• Immune-supportive functional activity of flaxseed and canola oils. • Analyze effects of fruit flavenoids on growth and proliferation of normal and oncogenic cell lines. • Determine bioavailability of sphingolipids in protein-rich fractions from defatted milk and soy foods.
3. Design innovative technologies to manufacture traditional and new food products.	3.1 Develop appropriate technologies to extract and stabilize value-added components from Ontario agricultural resources as well as manufacturing waste streams.	• Develop systematic pre-treatment process to liberate lycopene from waste tomato skins. • Develop software to estimate energy costs for typical supercritical process configurations. • Scale up process design for manufacture of infant formula oil and confectionary products from milkfat.
	3.2 Improve existing and develop new technologies for food preservation.	• Develop pre-storage treatments and storage management techniques to reduce losses due to apple scald disorder. • Evaluate biofilm formation on packaging materials and effects on shelf-life of ready-to-use spinach. • Design integrated treatment systems to improve safety and extend shelf-life of ready-to-eat foods.